PISTON FOR A HYDRAULIC DASHPOT, AND METHOD OF MANUFACTURING SUCH A PISTON

The present invention concerns a piston for a hydraulic dashpot as recited in the preamble to Claim 1. The invention also concerns a method of manufacturing such a piston.

Dashpots for motor vehicles are intended to attenuate the vibrations of the spring-suspended wheels, Such dashpots usually include a piston mounted on one end of a piston rod and traveling back and forth inside a cylinder.

A piston of this genus is known from German Patent 969 330. This device includes a one-way valve in the form of a cup spring or stack of cup springs subject to the force of a compression-application mechanism mounted on a threaded bolt. The valve's resilience is adjusted by rotating the compression-application mechanism.

The piston described in the aforesaid patent is accordingly adjustable, but extremely complicated, and must also be manufactured to very precise tolerances.

The object of the present invention is a piston with a valve, particularly a cup spring or stack of cup springs, with aa resilience that can easily be adjusted over a specific range. As in the piston described in German Patent 969 330, moreover, the resilience in the suction phase will be adjustable independently of the resilience in the compression phase and vice versa.

This object is attained in accordance with the present invention by the characteristics recited in the body of Claim 1. Advantageous further and advanced embodiments of the invention are addressed by Claims 2 through 10.

Claims 11 through 13 recite a method of manufacturing such a piston, and Claim 15 recites an advantageous way of attaching the piston to a piston rod.

The present invention has several advantages. Although the piston is simple, it can easily be employed to precisely vary the hydraulic impedances of both the compression phase and the suction phase. The tolerances involved in manufacturing the piston can accordingly easily be attained. The piston's characteristic curve can also be easily adjusted in both the compression and the suction phase. Finally, the piston can be produced simply and cost-effectively.

The present invention will now be specified with reference to the drawing, wherein Figures 1 through 4 are sections through different embodiments of a piston in accordance with the present invention and illustrate different approaches to its manufacture.

A piston 1 is conventionally mounted on one end of a piston rod 3 and travels back and forth inside a cylinder 2. Although the piston in the present embodiment is screwed onto the piston rod, other means of attachment are also possible.

Cylinder 2 is full of hydraulic fluid and is divided by piston 1 into two chambers 4 and 5. Piston 1 is provided with channels 6 and 7, each of which can be opened and closed by one-way valves in the form of stacks of cup springs, channel 6 by cup springs 8 and channel 7 by cup springs 9. The body 10 of piston 1 is in three parts, specifically a bolt 11 and two halves 12 and 13. Piston 1 is wrapped around by a binding 14 in the form of a band of low-friction plastic. Bolt 11 is provided with threads 15 at one and threads 16 at the other. The components of piston 1 are held together by nuts 17 and 18 at each end and by a washers 19. Cup springs 8 and 9 are in direct alignment with the body 10, and hence with the halves 12 and 13, of piston 1. Cup springs 8 and 8 can be tensioned against body 10 by rotating nuts 17 and 18 and washer 19, axially deforming halves 12 and 13 between the cup springs resiliently or even plasticly. This action requires the circumference of cup springs 8 and 9 to rest snug against outer annular sealing edges 20 and 21 on body 10. The tension applied by cup springs 8 and 9 can accordingly be varied.

The piston 1 illustrated in Figure 1 is provided with a bolt 11 surrounded by a collar 22. Collar 22 rests in depressions in halves 12 and 13 and is accordingly accommodated in them both axially and radially. Any tolerances or intentional play left between collar 22 and halves 12 and 13 can be compensated by a applying a hardening casting mass, achieving an especially axially solid attachment between the halves and the collar. The surfaces of contact between cup springs 8 and 9 are established by compression disks 23 and 24, facilitating

the desired resilient or plastic deformation by way of prescribed screwing forces.

The upper threads 15 on bolt 11 are welded into a shock-accommodating disk 25, fastening piston 1 to piston rod 3 and allowing adjustment of cup springs 8 and 9 to both the compression and suction phases by rotating nuts 17 and 18.

The bolt 11 in the embodiment illustrated in Figure 2 is composed of two halves 26 and 27 originally provided with heads 28 and 29. The two halves are positioned with their heads together and for example welded, creating collar 22, subsequent to which bolt 11 can be further fastened together as specified with reference to Figure 1. Halves 26 and 27 can, however, alternatively be cemented together along with their heads. Piston 1 is fastened to piston rod 3 as specified with reference to Figure 1 except that the shock accommodation is provided by washer 19, which simultaneously applies tension to upper cup springs 8. The head of bolt 11 is provided with a hexagonal recess 30 instead of a nut. Upper cup springs 8 can be tightened and tensioned as specified with reference to Figure 1 by means of nut 18 once upper cup springs 8 have been appropriately adjusted.

The facing surfaces of the piston halves 12 and 13 in the embodiment illustrated in Figure 3 are provided with depressions 31. In this embodiment as well, halves 26 and 27 the two halves are cylindrical, at least in the vicinity of body 10. Body 10 is designed to allow the halves to be

fastened together by burn-off butt welding for example, creating an outward-directed welding bead that fills depressions 31. Halves 26 and 27 and depressions 31 are relatively dimensioned to ensure that the bead will entirely occupy the depressions. Cup springs 8 and 9 can be tensioned by clamp connections 32 and 33, by welding, or by nuts 17 and 16.

To facilitate positioning and securing piston halves 12 and 13 in relation to collar 22 or heads 28 and 29, the surfaces of depressions 31 can be provided with knife-like radial or axial elevations that dig into collar 22 or heads 28 and 29. With piston halves 12 and 13 appropriately oriented in relation to piston rod 3 and to bolt 11 or halves 26 and 27 accordingly, the arrangement will be stable both axially and radially no matter how the system is finally assembled.

The piston halves 12 and 13 and bolt 11 in the two versions of the embodiment illustrated in Figure 4 can be fastened together in various ways. The bolts in both versions are composed of two halves 26 and 27 welded together inside piston halves 12 and 13. The bolt halves in the version represented in the left half of the figure are provided with collars 34 and 35 that, once the bolt halves have been connected, rest against the faces of the piston halves. All the components of body 10 are accordingly assembled together.

The mutually contacting surfaces of the piston halves 12 and 13 in the version represented in the right half of Figure 4

are provided with inwardly projecting noses 36. Once the halves 26 and 27 in this version have been welded together to create bolt 11, again cylindrical in the vicinity of body 10, the overall assembly will be stable.

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